Small Business Innovation Research/Small Business Tech Transfer

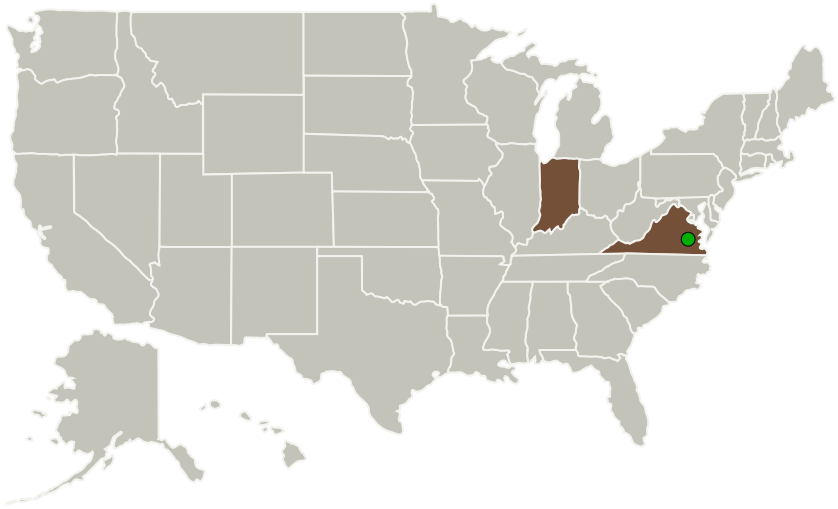
Electromagnetic Models and Software for the Nondestructive Evaluation of Carbon Nanotube Based Composites, Phase I

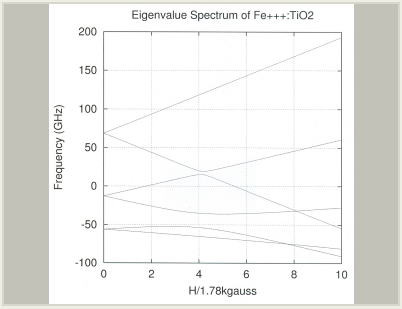
Completed Technology Project (2016 - 2016)

Project Introduction

The use of eddy-current methods to detect damage in aerospace structures,and to characterize materials is well established, and is a key item to ensure that the risk of structural failures meets the strict damage tolerance requirements established by NASA. This is especially challenging when one considers that common aerospace structures are made from such disparage materials as aluminum, titanium and steel alloys, as well as carbon-fiber reinforced polymers (cfrp) and carbon-nanotube reinforced polymers (cnrp) that are seeing increased applications at NASA. Further the structural environments can be quite complex, including compound curvatures and/or multiple layers that are fastened together, with potential damage being located in each of the multiple layers. To address this need, Victor Technologies has developed VIC-3D(R), a comprehensive eddy-current modeling code for solving forward and inverse problems in nondestructive evaluation (NDE). Certain problems in modeling forward and inverse problems produce huge data sets, often requiring days of computation. In this proposal, we will enhance VIC-3D(R) for near real-time large-scale nondestructive simulations and automated data reduction/analysis of large data sets. Furthermore, we will add models to VIC-3D(R) that will allow the characterization of cnrp composites by electromagnetic means nondestructively. The result will be the first such commercial code for characterizing advanced composites by electromagnetic means nondestructively.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Victor Technologies, LLC	Lead Organization	Industry Veteran-Owned Small Business (VOSB)	Bloomington, Indiana
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Indiana	Virginia

Project Transitions

June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139668)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Victor Technologies, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

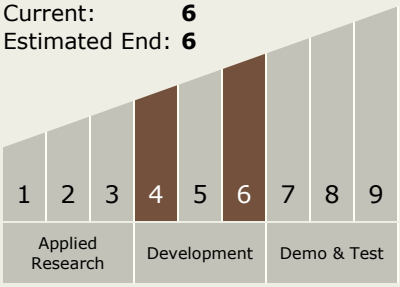
Carlos Torrez

Principal Investigator:

Harold Sabbagh

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



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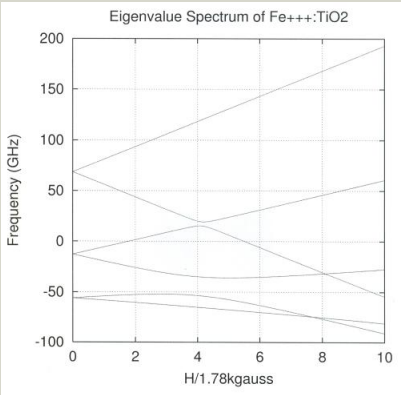
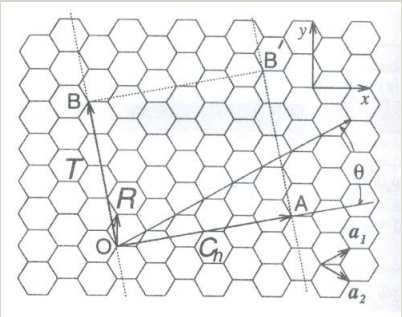
Images



Briefing Chart Image
Electromagnetic Models and Software for the Nondestructive Evaluation of Carbon Nanotube Based Composites, Phase I
(https://techport.nasa.gov/image/136141)



Final Summary Chart Image
Electromagnetic Models and Software for the Nondestructive Evaluation of Carbon Nanotube Based Composites, Phase I Project Image
(https://techport.nasa.gov/image/133725)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.5 Nondestructive Evaluation and Sensors

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System